WSI Filter Troubleshooting

I. Purpose:

This procedure describes how to troubleshoot WSI spectral filter in various scenarios.

II. Cautions and Hazards:

- Do not touch photodiodes (see Steps B8 and B10).

III. Requirements:

- Allen wrench 3/32 to drive 4/40 Allen-head screws

IV. Procedure:

A. Verifying Current Status:

1. First watch the system and verify that the SP filter LED lights on the ACP panel are still not lit, and not changing. Verify that the image still looks Ok. Verify that the ND filter is still lit; should be in ND 3 during the day.
2. Put the Sensor ACP into local by turning the local enable key on, and the local/computer switch to local. Try moving the filter wheel. Verify that it still does not move in either direction.
3. Return the Sensor ACP to Computer mode.
4. Do a full power down of the system, including the computer. Then power back up (ACP goes on before computer), and verify that system performance as checked in items 1 and 2 has not changed.
5. Exit RunWSI.

B. Evaluating Filter Wheel and Filter Wheel Motor, and Returning to Full Operation if Possible:

In the next series of steps, you'll be removing the lens, much as you did during installation, and then removing the filter changer shroud, to give you access to the filter wheel.

1. Find the lens case and lens covers. Set them nearby for use in Step 6.
2. With the system turned on, and the ACP in local, go out to the white box, and remove the black sunshade and foam insulators to give you access to the camera housing.

3. Remove the 12 4-40 Allen-head screws on the OUTER ring on the camera housing top plate, by backing out the screws a bit at a time in a star pattern. That is, back out the screw to the south a couple turns, then the one to the north, then E, then W, etc. The nitrogen will start escaping at some point during the procedure. Continue until the screws are out, saving them someplace safe, and remove the lid. (If you drop one, there should be spares in the WSI supplies kit.)
4. Remove the foam insulators inside the camera housing.
5. Being careful not to change the lens settings, carefully remove the lens by rotating it about 1/3 turn clockwise. Put on the lens covers and put the lens in its case.
6. Remove the desiccant packs, and put them in a Ziplock baggy.
7. Before you do the next step, I should alert you that inside the filter changer shroud, there will be some photodiode emitters/detectors that it is important not to touch, as they can be damaged by electrostatic. In the next step, try to touch nothing inside the filter changer. There is nothing dangerous, no AC power, so you won't be hurt, but the photodiodes could be hurt.
8. The filter changer shroud is a smooth metal rectangle, about 6 x 6 x 1.5 inches. There are two screws on the top that hold it down. Remove these two screws and remove the shroud.
9. Inside, on the top plate of the Filter Changer (FC), which has been exposed, you should see the two motors for the two wheels in 2 of the corners, labeled Airpax. A third corner of the FC top plate has 3 small elements with 4 wires coming from them. These are the photodiodes that must not be touched.
10. The SP wheel is the lower wheel. Before touching anything, look to see if there are any obvious symptoms - something loose, something sticking up and binding the wheel, ground metal filings, cut wires, etc.
11. Feel both motors. The SP motor is the one on the left, if the motors are on the side near you. Note whether they are close to the same temperature. (The SP motor may be extra hot, if it has been pulsing to try to unstick the wheel, or if it has pulsed enough to kill it, it will be cold.)
12. Watch the wheel while someone tries to move it in local. It probably will not move.
13. In this step, you will be moving the wheel. As you start to move it, try to note if the wheel seems to be physically stuck, i.e. difficult to move. If the gears are slightly out of mesh, you probably won't feel

anything obvious, but if something has somehow come loose, and there is something mechanical in the way, you can probably tell at this stage. (You can move it by reaching your finger under the FC top plate and touching the rim of the wheel.) If it moves at all, go ahead and move it about 30 degrees. If the motor is still alive, it should grab the wheel and try to move it to the next position. If the motor has died, it will not try to move it.

14. If the motor appears dead, skip to Section C; otherwise, proceed to Step 16.

15. If the motor did grab the wheel in Step 12, see if it will now turn under local control on the ACP. If it does not, turn everything off and try spinning the wheel to see whether it spins freely. Power back up and try again.

16. If you can get it to respond under local, now try under computer control by returning the ACP to Computer and running RunWSI. (If it's easier for you, there is probably a test program under WSITEST/Sensor called MOVESF.EXE which, when started, is designed to cycle the filter wheel a few times.)

17. If at this point it is operational, return the ACP to local and continue. Otherwise, return the ACP to local and skip to Section C.

18. If the FC is now working under local and computer control, it can be returned to service. If you see obvious dirt on the filters, they may be cleaned with the lens cleaner in the supplies kit, or blown off with the lens brush in the supplies kit. At this point, skip to Section D, which documents putting the system back together.

C. Setting Up Red Filter (if the FC is not working):

If the FC is working, skip to Section D; otherwise, if the FC is not working, do the following steps.

1. With the ACP in local, put the ND wheel into position 3, if it is not already there.

2. If the motor is dead, slowly turn the wheel manually and have someone see whether the lights on the ACP panel light up. If they do, then turn the wheel until the SP 3 wheel lights up and skip to Step 6.

3. If the ACP lights do not light up, or the SP 3 position does not light up, first use the ACP to change to ND 1.

4. There are 3 holes in the FC upper plate through which filters may be seen. The light normally goes through the central hole, which is the one centered under the lens mount. In this hole, you should see a

clear glass filter (with it in ND 1) with a SP filter under it. We will be turning the SP wheel so the correct filter is in this central hole.

5. If you turn the SP wheel manually, you should see that one filter reflects blue light and looks like a blue mirror, one looks like a yellow mirror, one looks like a plain mirror, and one looks like glass. The filter we want is the one which looks like a blue mirror. Turn the SP filter wheel until this filter is centered under the upper filter in the upper wheel. (This filter looks like a blue mirror, but it actually lets through red light to the camera.) Do not move the SP wheel after this step; or, if it somehow gets moved prior to closing up the system, put the wheel back in this position.
6. Put the ND position back to ND 3 using the ACP.
7. Put the ACP back into local. In this setting, the ACP should not try to move the filter, and we should be able to acquire red filter images. Verify that the SP wheel is still where you set it in Step 6, and continue with Section D.

D. Putting the System Back Together:

1. Carefully check to be sure no wires are in the way of the filter changer shroud, and place the shroud on, verifying again that you're not pinching any wires. Screw down the shroud.
2. Place the desiccant back in the camera housing, or use new desiccant. This desiccant should be enough to absorb a camera housing full of hot moist air several times, but it's a good idea to use new if there is any. There should be some in the supplies kit.
3. Try not to move the lens settings. Check that they are at infinity and f/2.8. If they are not, put them at infinity and f/2.8. Install the lens by turning it gently until you find the one position in which it drops down and engages, and then turn 1/3 turn counter clockwise to lock in place.
4. Return the two foam rings, with the gaps in the foam rings on opposite sides of the camera housing (for additional stray light reduction).
5. Verify that the fisheye lens is clean, and clean if needed. Ditto for the camera-housing dome inside.
6. If the o-ring, which seals the camera-housing lid, has not gotten dirty during this procedure, proceed to the next step. Otherwise, clean it with alcohol, and then use a dab of o-ring grease (found in supplies kit) and run the o-ring between your thumb and fingers until it is smoothly and uniformly greased with a very thin layer.

7. Reinstall the camera housing top plate by using the opposite of the procedure in Step B3, i.e. using a star pattern and snugging down the screws a bit at a time on all sides until it is down snugly.
8. Verify that the system is still working, and then pressurize the camera housing to about 5 lb.
9. Return the two foam insulator rings, and return the sun shade to place using the 12 bolts removed in Step B2.
10. Have a beer or whatever is allowed. You deserve it!

V. References:

1. WSI Operations Manual, MAN(WSI)-002.001
2. WSI Maintenance and Troubleshooting Manual, MAN(WSI)-004.000

VI. Attachments:

None.